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ABSTRACT

The model developed in this article is intended to help the finance manager of a tuition-supported school make calculated investments of surplus moneys. It is designed to make funds available to pay salaries and bills when needed and to add interest in increasingly larger amounts to the available funds of the school. It assumes that the finance manager must keep an adequate supply of cash available for the demands of the immediate period, avoid idle cash piling up in a commercial bank, and prorate receipts over the whole fiscal year. The system schedules treasury bills and certificates of deposit to be purchased so that they will mature on each specific date when checks are to be written. It is intended to accomplish a smoothing of funds across the year, thus assuring cash to meet predicted obligations as they occur and a steady stream of interest 38 times during the course of the fiscal year.
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CASH FLOW SMOOTHING FOR SCHOOLS

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To provide an adequate flow of cash for a tuition-supported school or college to meet current demands is always a heavy responsibility. The purpose of this article is to help alleviate this burden by the development of a cash-smoothing method for that type of institution where revenue is fixed and is received at fairly indentifiable times, generally in advance of services, and only during certain portions of the fiscal year.

The problem here is threefold: (1) how to keep an adequate supply of cash available for the demands of the immediate period; (2) how to avoid idle cash piling up in the commercial bank; and (3) how to prorate receipts over the whole fiscal year.

Although banks use the money of its many depositors, up to the limits established by law, there is a great deal of uncertainty as to the amount and duration of any balance in a demand deposit. In order for them to know how long they

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may have use of these deposits, banks may solicit large depositors to avail themselves of the modern device of lending to the bank. This method is a time-deposit usually known as a certificate of deposit (CD).

General Assumptions.

1. This study assumes that the work is for a church related school with an enrollment of 800 students, and an annual tuition charge of $500. Tuition is payable in full in two equal parts--at the beginning of each semester. However, some receipts may lag for several months.

2. Other income, from an annual registration fee, from athletics, lunchroom, bookstore, dramatics, band activities, and all other income generated through student participation, is not considered in this basic model. Real-life adjustments can be made at points of departure after the basic principles are accepted, but such adjustments should be made one at a time, as in sensitivity testing, rather than attempting to adjust all discrepancies at once.

3. Since an educational institution is a service-oriented, people-dominated operation, it is not unusual that, except for capital improvements, an average of some 75 per cent of all expenditures goes into payroll. The remaining 25 per cent will go to (a) normal operations, (b) debt service, and (c) retained earnings in a ratio of approximately 1:2:2. Cash, therefore, is the necessary life-blood of school operations; and the book balance of the cash account can be conceived as inventory so that normal inventory control models may be applied. [1]

4. It must be noted that "yesterday" is forgotten, and the actions or decisions of the past have no effect on the optimal decisions for "tomorrow"--that is, any period in the future. Also, for the sake of the recursiveness of this model, as well as in actual fact, school management is assumed to be a continuing affair, and surpluses (or deficits) of the current fiscal period are carried over into the next year.

5. To follow a trend that is gathering more usage in different religious Orders, members of the Order will be paid at the full rate, according to their qualifications. This separates the finances of the institution from the Order, and precludes the use of the entry made by some institutions under the title of Contributed Services. This is not to say that no recognition should be made of the various and sundry contributed services of lawyers, architects, plumbers, electricians, and other laymen who are willing and able to give of their time and talents without charge. But the real monetary contribution of the religious Order to the operation of the school is found in the amount of cash that is refunded to the school by the Order. Intangibles of devoted service rendered by both religious and lay will be recorded only in heaven.

Rules of the Model.

1. All money that pertains to this model will be considered as the "source;" designated paydays will be called "sinks."

2. Today's obligation must be met, even at the cost of

loss of interest. Funds which are on hand but not needed for the current pay period are invested in interest-bearing securities.

3. All members of the faculty and administrative and maintenance staffs are on continuing twelve-month contracts, and will be paid every second Friday beginning with the first Friday in September.

4. Accounts payable will be paid on the tenth of each month. Although this is probably not a completely realistic practice, the purpose at present is to separate normal accounts payable from the payment of personal service to members of the faculty and staff.

5. All obligations up to and including August 31, 198A, are paid in full.

6. The cash book balance at August 31, 198B, is exactly $500, the amount that is defined as the "cushion"--a permanent amount left in the bank to avoid danger of overdraft.

7. There will be a flow of tuition income as follows:

First Semester

September. . . .	$20,000	weekly, or	$100,000;*
October.	15,000	weekly, or	60,000;
November	10,000	weekly, or	40,000.

Second Semester

January.	$25,000	weekly, or	$100,000;
February	10,000	weekly, or	40,000;
March.	10,000	weekly, or	50,000;*
April.	10,000	one week, or	10,000.

8. Treasury bills and certificates of deposit will be purchased so that they will mature only on the specific dates when checks are to be written. This is a key assumption of the model, and the whole plan circles around this point: the salary or demand that is due today will be met by the securities maturing today.

9. At the end of each day even $1000's are taken from the book balance for the purchase of CD's, leaving the $500 cushion, plus some amount less than $1,000.

10. Except for the stripping of the cash account each day, "activity" is considered to occur only on paydays, which, as noted, are every other Friday, and the tenth of each month. Funds collected between activity days are placed in short-term CD's until the correct target range of the 91-day and 182-days bills or CD's is available to allow for maturities on the desired date. The aim is not the 91- or 182-day term, but the demand date. Local banks will generally cooperate with the school finance manager in setting these dates.

11. The personal service and accounts payable demands of the school is distributed over the 26 personal service sinks and the 12 monthly pay periods. Calculated at 110 per cent of demand, to allow for social security, and error of calculation, the 26 payroll sinks round upward to $14,000 each bi-weekly pay day.** Again using 110 per cent (allowance for discrepancies not conforming to the assumed smooth averaging) the monthly sinks requirement would be $2,000. Note that the rounding is not exact. Whole numbers are used for the simplicity of the illustration.

Procedure.

1. Set up a large worksheet identifying sinks for the school year across the top. Determine source days down the page. Note in the accompanying illustration that receipts of September 1 are used to pay salaries and the remainder ($6,000) is put in CD's to mature March 2. September 8 receipts are used to pay tenth-of-month accounts payable and CD's are purchased to fill both December 8 and December 10 sinks; then the remaining $2,000 swing back to help fill March 2 sink. September 15 receipts are needed to pay salaries due that day; the remainder goes into CD's to complete March 2 sink.

2. Once all first semester sinks are filled, all available funds in the source are "leapfrogged" to the next 182-sink. Thereafter, maturing sinks will take care of current demand.

3. Notice the condition of the model beginning March 2, March 30, and occurring in many subsequent 182-day sinks where it takes the residual amount of several weeks to complete the filling of a particular sink.

4. If the source is sufficient to pay current accounts payable, but cannot also make a full 91-day sink, then the funds left over will go to the next incomplete 182-day sink, bypassing the 91-day level.

5. If source day is not also a sink day, complete one or more 91-day sinks; if funds are inadequate to complete a single 91-day sink, hold the total amount in short-term CD's to add to the following Friday's total receipts. See the illustration for November 3 and November 10. The latter demand is filled on higher priority--accounts payable due

that day; but the remaining $8,000 cannot fill a 91-day sink. Therefore, this amount is held and added to the next week's receipts. This situation will probably occur only when income is slowing down and/or in the first year of operation. After sinks begin maturing, constraints will be lessened and only the longer range sinks will be worked on with these smaller weekly receipts.

A Complication Arises.

As the simulation in this study worked through to the end of the fiscal year, a goodly number of special situations were met. A reader or potential user would have noticed that $14,000 and $2,000 simulated demands are larger than actually required. Each sink should have some money left over which can easily be reinvested in the next available sink. Attention is called to July 6. A shortage of $4,000 prevents the complete closing of all sinks for the fiscal year, although funds would have been already invested in sinks for the coming fiscal year. If, in actual practice, this particular sink had not been filled by the left-overs from other sinks, then, there are several alternatives open to the decision-maker: (a) borrow from the bank; (b) sell a $4,000 or a $6,000 note of August 31; (c) study needs--maybe total salary demand has changed during the summer through the resignation of a teacher and the replacement is not yet under contract for payments.

Conclusions.

Assuming that the model described in this article is

working then interest will start coming in with the bi-weekly maturities beginning December 8. This would assure a smoothing of funds across the year, assure the ability of the administrator to meet predicted obligations as they occur, and have a steady stream of interest 38 times during the course of the fiscal year.

NOTATIONS

[1] Readers who are interested in the mathematics of this model are urged to consult:

Ackoff, Russell L., and Maurice W. Sasiene. Fundamentals of Operations Research. New York: John Wiley & Sons, Inc. 1968.

Wagner, Harvey M. Principles of Operations Research with Applications to Managerial Decisions. Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1969.

* There are five Fridays in September, 198A, and also in March, 198B.

** Income is $400,000. Salaries equal 75 percent of this amount; bonded debt, 10 percent; and accounts payable, 5 percent. Applied at 110 percent of itself, this adds up to 99 percent of the total income. For the sake of simplicity, this discrepancy of 1 percent is ignored and rounded figures are used.